

FY 1980 RDT&E DESCRIPTIVE SUMMARY

Program Element: #35158F

Title: Satellite Data System (SDS)

DoD Mission Area: Strategic Command, Control and Communications, #331

Budget Activity: Strategic Programs, #3

RESOURCES (PROJECT LISTING): (\$ in thousands)

Project		FY 1978	FY 1979	FY 1980	FY 1981	Additional	Total
Number	Title	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>to Completion</u>	<u>Estimated</u>
N/A	TOTAL FOR PROGRAM ELEMENT	12,800	23,500	36,300	25,500	Continuing	Not Applicable

BRIEF DESCRIPTION OF ELEMENT AND MISSION NEED: The Satellite Data System (SDS) is a multi-payload, communications satellite which provides reliable and secure communications. Operating in conjunction with the synchronous equatorial Fleet Satellite Communications (FLTSATCOM) satellites, the SDS completes the coverage required by the Air Force Satellite Communications (AFSATCOM) system for essential command and control communications to our nuclear capable forces.

BASIS FOR FY 1980 RDT&E REQUEST: This request includes funds for continuing the multi-year design and development efforts to improve the anti-jam capabilities of the AFSATCOM payload. Also included are the multi-year developments necessary to transition follow-on satellites to the Space Shuttle. Sustaining engineering support will be required on a continuing basis.

OTHER APPROPRIATION FUNDS:

	FY 1978	FY 1979	FY 1980	FY 1981	Additional	Total
	<u>Actual</u>	<u>Estimate</u>	<u>Estimate</u>	<u>Estimate</u>	<u>to Completion</u>	<u>Estimated</u>
Missile Procurement	83,200	37,900	1 00,300	107,500	Continuing	Not Applicable
Quantities						
Satellites	1		1	1		
Launch Vehicles	1 (Agena)					

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DETAILED BACKGROUND AND DESCRIPTION: The Satellite Data System (SDS) provides critical, real-time command, control, and communications for Strategic Air Command Single Integrated Operational Plan (SIOP) and other nuclear capable forces. The SDS is an integral part of the Air Force Satellite Communications (AFSATCOM) system which includes the Air Force Ultra High Frequency (UHF) communications capability on the synchronous equatorial Fleet Satellite Communications (FLTSATCOM) satellites, piggy-back transponders on selected host satellites, and airborne/ground radio terminals. As such, the SDS will complement the FLTSATCOM satellite coverage by providing UHF coverage which the FLTSATCOM satellites cannot provide.

satellites is necessary to partially compensate for the reduced coverage and communications capacity which will result from fewer FLTSATCOM satellites being deployed through FY 1983. Additionally, SDS will support the Air Force Satellite Control Facility (AFSCF) requirement for reliable, two-way high data rate, S-band communications between AFSCF remote tracking stations.

direct benefits of SDS will be reliable and secure direct communications. The result in greatly improved command and control of our nuclear capable forces, elimination of the dependence on some of the vulnerable AFSCF communications which will

RELATED ACTIVITIES: The space segment of the FLTSATCOM will be developed, procured, and launched under the Navy's FLTSATCOM Program Element, 33109N. The Air Force aircraft and ground UHF radio terminals required for operation with the FLTSATCOM and SDS satellites are funded within the AFSATCOM Program Element, 33601F. The AFSCF stations are funded under the AFSCF Program Element, 35110F. Space Shuttle and Inertial Upper Stage flights for all operational Air Force satellites, including those for SDS, are provided by the Space Launch Support Program, PE 35171F.

WORK PERFORMED BY: Air Force Systems Command's Space and Missile Systems Organization, Los Angeles, CA, is responsible for the SDS. The prime contractor is Hughes Aircraft Company, El Segundo, CA. General Systems Engineering and Integration is performed by the Aerospace Corporation, El Segundo, CA.

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PROGRAM ACCOMPLISHMENTS AND FUTURE PROGRAMS:

1. FY 1978 and Prior Accomplishments: The technology phase of the program was completed in FY 1971. This was followed by a contract definition phase in FY 1972 which established the system configuration. The system acquisition contractor was selected by competitive source selection and a system development contract was awarded in June 1972. The system Critical Design Review (CDR) was successfully completed in March 1974 with all critical specifications being met or exceeded. The structural (X-1) and qualification (Y-1) model spacecraft and the initial flight vehicle (F-1) were procured incrementally with Research, Development, Test and Evaluation (RDT&E) funds. A production option to the development contract was exercised in FY 1974 providing for the fabrication, assembly, and test of the first production spacecraft (F-2) and (F-3). The development and production schedules were phased to achieve the required delivery, launch, and system operational dates. Communications subsystem engineering models were completed and tested in November 1973. The structural model satellite testing was finished in May 1975. A qualification model satellite was built and tested to fully qualify the satellite prior to production.

checked out on-orbit. Full operational capability was declared for all payloads after successful on-orbit checkout. Primary activities in FY 1978 included sustaining engineering support, design and development efforts to transition follow-on satellites to the Space Shuttle, and reliability improvement activities.

Refurbishment of the Qualification Model Satellite (Y-1) was begun. When fully refurbished, Y-1 will become the fourth operational satellite (F-4).

2. FY 1979 Program: Efforts for this year include sustaining engineering support, initiating design and development activities to improve the anti-jam capabilities of the Air Force Satellite Communications System (AFSATCOM) payload on the sixth SDS satellite (F-6), and continuing the multi-year development necessary to transition to the Space Shuttle. Also included are continuing efforts to improve satellite payload reliabilities.

3. FY 1980 Planned Program: The increase from FY 1979 to FY 1980 is due to the fact that the Space Shuttle transition and AFSATCOM anti-jam improvements continue full scale development in FY 1979. Multi-year development efforts will continue to permit follow-on satellites (F-6 and subsequent satellites) to transition from the current expendable launch vehicles to the Space Shuttle. A major multi-year development program will continue to enhance the anti-jam characteristics of the Air Force Satellite Communications (AFSATCOM) System payload. Sustaining engineering support will be required on a continuing basis.

4. FY 1981 Planned Program: The FY 1981 plan is to continue sustaining engineering support, continue development of the anti-jam improvements for the AFSATCOM payload and continue the development efforts related to Space Shuttle optimization.

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5. Program to Completion: This is a continuing program. As an integral part of the AFSATCOM (Air Force Satellite Communications) System, the program will continue to provide critical communications coverage and be totally compatible with the AFSATCOM aircraft and ground radio terminals. Sustaining engineering support will be required to maintain design compatibility and to incorporate improvements for survivability and reliability.

6. Milestones:

Date

System Preliminary Design Review

Mar 73

System Critical Design Review

Mar 74

Final Integrated Systems Test

Launch First Satellite (F-1)

Launch Second Satellite (F-2)

Full Operational Capability

AFSATCOM System IOC

May 79

7. Resources: Not Applicable

8. Comparison with FY 1979 Budget Data: Not Applicable

Budget Activity: #4 - Military Astronautics and Related Equipment

Program Element: 35158F - Satellite Data System

Test and Evaluation Data

1. Development Test and Evaluation: The development contractor for the Satellite Data System (SDS) is Hughes Aircraft Company, El Segundo, California. The first satellite was launched

Initial Operational Capability was established. The first satellite (F-1) was funded entirely within the development program. The second satellite (F-2) was the first vehicle funded under the production program. The development hardware includes engineering models of the communication subsystems, a structural model spacecraft (X-1) and a full-up qualification model spacecraft (Y-1). Development tests of the communications subsystems engineering models were completed in November 1973. Structural testing was satisfactorily completed on the X-1 engineering model spacecraft in May 1975. Systems level qualification was completed in October 1975 with all critical performance specifications met or exceeded. System level qualification is designed to demonstrate design integrity and performance to specification via a series of tests including shock, acoustic, modal survey, thermal, electromagnetic interference (EMI), solar-thermal vacuum, and integrated system test. Reliability (life) tests of critical components will continue throughout the development program. The F-1 spacecraft was acceptance tested during the. The Y-1 spacecraft is a full configured spacecraft which will be refurbished and used as a back-up flight vehicle (F-4).

2. Operational Test and Evaluation: A portion of the SDS Satellite system is to be part of the Air Force Satellite Communications (AFSATCOM) space segment. Classical separate IOT&E was not conducted on the space segments since all operational objectives/requirements were fully integrated into the DT&E effort and were not broken out separately. Compatibility, operational characteristics and orbit performance of payloads supporting AFSATCOM are scheduled to be demonstrated during the FOT&E of AFSATCOM. FOT&E of AFSATCOM is to be managed by AFTEC and scheduled to begin in FY 80. Results to date are contained in DT&E reports (see para. 1 above).

3. Systems Characteristics:

a. UHF mission characteristics

240-400 MHz

12 - 5 KHz channels, 75 BPS, two-way teletype

Anti-jam capability -

Frequency selection, anti-jam capability and activation of the SIOP execution direction are commandable from Airborne Command Post or Ground Command Post.

b. AFSCF Mission Characteristics

1.76 ~ 2.3 GHz (S-Band)

Data Pass - 256 KBs, 32 KBs

e. Orbital life Mean Mission Duration (MMD)

Mission characteristics were validated during Development Test and Evaluation (DT&E). Operational characteristics and orbit performance of payloads supporting other systems will be demonstrated during the Operational Test and Evaluation (OT&E) of the supported system, e.g., Air Force Satellite Communications System (AFSATCOM).